ADDENDUM
THE OESER COMPANY SUPERFUND SITE
FEASIBILITY STUDY REPORT
BELLINGHAM, WASHINGTON

1. INTRODUCTION

Ecology and Environment, Inc., has developed a feasibility study (FS; E & E 2002) for the Oeser Company Superfund site (Oeser). This FS Addendum has been developed to evaluate an additional alternative, Alternative 6, which reflects a combination of Alternatives 2 (Capping) and 3 (Excavation).

2. SUMMARY OF ALTERNATIVE 6: CAPPING AND EXCAVATION

Alternative 6 combines capping with soil excavation and disposal. Under Alternative 6 as many of the contaminated areas as possible would be excavated, while allowing for continued operation of The Oeser Company facility. Areas that could not be excavated without disrupting The Oeser Company's existing operations would be capped under this alternative. Alternative 6 would consist of installing a cap to inhibit the vertical infiltration of precipitation into the contaminated soil and to reduce the potential for site personnel and the community to come into direct contact with contaminated soil and shallow groundwater. Although this alternative would meet the remedial action objectives (RAOs) for soil and shallow groundwater effectively, contaminated soil and shallow groundwater would not be removed in capped areas. Institutional controls and long-term operation and maintenance (O&M) measures would be implemented to ensure the protectiveness of the cap.

To meet the RAO for on-facility soil in areas that would not be capped, this alternative includes excavation and off-site disposal of soil containing contaminants above cleanup levels (CULs). Existing contaminated soil would be removed from the site, which also would reduce the source of groundwater contamination and meet the RAO for shallow groundwater. To meet the RAO for deep groundwater, institutional controls would be implemented to restrict its use on The Oeser Company property and long-term monitoring would be implemented through this alternative.

3. DETAILED ANALYSIS OF ALTERNATIVE 6

In this section, Alternative 6 is described and evaluated on the basis of the seven evaluation criteria presented in subsection 4.1 of the FS (E & E 2002).

3.1 Description of Alternative

This alternative includes the excavation and off-site disposal of contaminated soil followed by the backfilling of excavated areas with clean fill. In areas with soil contamination exceeding the site-specific CULs, where excavation is limited by current site activities, capping would be implemented as described in Alternative 2. Institutional controls to restrict the use of deep groundwater also would be implemented through this alternative. The proposed excavation areas include portions of the North Pole Yard, the South Pole Yard, the Treated Pole Area (TPA), the North Treatment Area (NTA), and the Wood Storage Area (WSA). It is assumed that surface soil contamination extends down to 6 inches; subsurface soil excavation may extend as deep as 9 feet. The areas proposed for excavation are shown by subarea and depth in Figure 1 and the estimated volume of soil to be excavated by subarea is presented in Table 1. The proposed areas to be capped include portions of the West Treatment Area, the East Treatment Area, and the WSA. The total area proposed for capping is 1.16 acres. Table 1 provides the estimated size of the subareas proposed for capping. Figure 1 depicts the areas proposed for capping and those areas that are currently paved.

The two classes of contaminants that most significantly influence risk at wood-treating facilities are carcenogenic polynuclear aromatic hydrocarbons (cPAHs) and dioxin/furans. These two contaminants are the most common contaminants at The Oeser Company facility; therefore, contaminant volumes are delineated within each subarea according to these classes. There are a few locations where pentachlorophenhol, total petroleum hydrocarbons, and naphthalene levels exceed the CULs; however, these areas are co-located in areas of cPAH and/or dioxin/furan contamination.

Under this alternative, approximately 3,400 cubic yards of contaminated soil would be excavated, de-watered as necessary, and loaded onto rail cars. After receipt of confirmation data, the contaminated soil would be transported by railway to an appropriate landfill. Verification sampling would be conducted to confirm removal of all contaminated soil from the areas of concern. After excavation is complete, excavated areas would be backfilled with clean fill and re-vegetated as necessary.

During excavation, backfill, restoration activities, and dust levels would be monitored continuously by the construction manager for fine particulate levels both upwind and downwind of potential dust-generating activities. Dust control measures would be required, especially if dust emissions above a pre-determined level occur. These measures may include spraying water, plastic tarp, plywood walkways, or other procedures, depending on the area of concern.

Under Alternative 6, groundwater monitoring and groundwater use restrictions would be implemented as described under Alternative 2.

The purpose of installing a cap at the site would be to prevent direct contact with surface soil contamination and to inhibit vertical contaminant migration by minimizing stormwater infiltration. The objective of the design is to construct a cap that meets the substantive closure requirements under RCRA Subtitle C; in addition, the cap should be capable of withstanding the impact of heavy equipment traffic associated with on-going operations at the site. In 1995, The Oeser Company installed a cap in the TPA. The cap was constructed with asphalt concrete paving. During the 1997 to 1998 Removal Action, caps constructed with environmental asphalt concrete paving were installed in the NTA. Some modifications to the existing asphalt at the site may be required in order to enhance the impermeability and therefore meet the substantive closure requirements for a landfill under RCRA Subtitle C. Additionally, a multi-level, impervious cap which meets the substantive closure requirements for a landfill under RCRA Subtitle C would be designed for the areas not covered currently. One cap being considered is a multilayer cap designed such that the cap can handle heavy equipment traffic. For this cap, an O&M plan would require development. O&M of the cap would involve inspecting the cap’s structural integrity, conducting preventative maintenance on the cap, and repairing damage to the cap.

An important aspect to consider when designing the cap for the site is how to manage stormwater drainage. The existing stormwater treatment system installed at the site can treat up to 60 gallons of water per minute; however, the system normally treats a maximum of 30 gallons of water per minute. It is possible that the drainage system designed for the new cap could be tied into the existing drainage system. If a subsurface drainage system is installed to convey stormwater to the stormwater treatment system, then the system would need to be designed such that the catch basins and piping did not leak. As part of the O&M of the cap, the drainage system would require inspection, preventative maintenance, cleaning, and repairs as necessary.

Based on a brief review of the site topography and the existing storm drainage system, drainage improvements may be necessary for some portions of the proposed areas to be capped. The drainage improvement may involve installation of stormwater catch basins and underground piping for diverting and connecting the flow towards the existing on-site stormwater management system.

Under Alternative 6, long-term O&M would be required. Operational use restrictions on the cap also would be necessary to preserve the integrity of the cap and to ensure long-term protection of human health and the environment. Institutional controls would be required as discussed below.

Institutional Controls. A restrictive easement or covenant and an enforcement order or consent decree would be required to limit future nonindustrial (i.e., residential) use. In addition, institutional controls would be employed to restrict the use of shallow and deep groundwater at the facility. Institutional controls for the deep groundwater involve implementing restrictions that would prevent the installation of wells for use as potable water on The Oeser Company property. It is expected that this restriction would be part of a restrictive covenant and enforcement order or consent decree.

Shallow Groundwater Monitoring. Monitoring that would be implemented for the shallow groundwater includes periodic sampling of the shallow groundwater for non-aqueous phase liquid (NAPL) and contaminant of concern contamination. The monitoring program for the shallow groundwater likely would consist of water level measurements, field measurements of water quality parameters, and collection and analysis of samples from shallow groundwater monitoring wells at the site. Shallow groundwater monitoring wells that likely would be included in the monitoring program would be the three wells that contained NAPL prior to the 1997 to 1998 Removal Action[1] and wells co-located with deep wells that would be monitored as part of the deep groundwater monitoring program. Analytical data would be compared to previous data to determine the effectiveness of the action taken. If NAPL is found in wells during the monitoring program, actions would be taken to remove it. Under this alternative, a passive removal system, rather than an active removal system, would be employed. A passive removal system would be as effective as an active removal system but would not involve any additional space or power requirements and would be less labor-intensive. The passive removal system proposed for use at the site includes installing an oil-absorbent material in the well. Because the absorbent material is hydrophobic, it only picks up NAPL. Once removed from the well, the NAPL-saturated absorbent material would be transported off-site to a treatment, storage, and disposal facility for incineration.

Deep Groundwater Monitoring. Monitoring to be implemented for the deep groundwater would include periodic sampling of the deep groundwater zone. The objective of this monitoring would be to record significant changes in plume concentrations and shape in order to determine whether the plume is migrating off site. Such an objective would be accomplished by collecting and analyzing samples from the wells that define the maximum geographic extent of possible remediation efforts and the single well with the highest concentrations of contaminants. The following existing wells at Oeser are the wells that likely would be the most beneficial for monitoring: MW05-D, MW33-D, MW02-D,

[1] These wells include MW07-S, MW13-S, and MW26-S.

MW35-D, MW06-D, and MWLSC03 (FS Figure 1-9, E & E 2002). Installing additional wells is not recommended at this time.

Additional Requirements. Although not subject to the United States Environmental Protection Agency's (EPA's) final remedy, the following requirements would further restrict deep aquifer usage for human consumption.

Water quality testing is required for new land development in Whatcom County, including subdivision and commercial building. When there are suspected contaminants in the groundwater, the county can require that the drinking water be tested specifically for those contaminants. If the levels of contaminants exceed drinking water standards, the water cannot be used in the development for human consumption until groundwater treatment has reduced contaminant levels below drinking water standards. The contamination present at the property and the treatment method would be noted on the property deed. Potential future property owners would become aware of the contamination when performing the title search on the property.

Whatcom County currently requires a water quality disclosure statement as part of all property sales. The disclosure statement provides information to the potential buyer regarding well testing and analytical results, known contamination, and other issues concerning the water quality at the property in question. This allows the prospective property buyer information about the property's water quality prior to purchasing the property. It also provides information as to whether or not the installation of a drinking water well on the property would be appropriate and if the water contained in the well would meet drinking water standards. Based on the results of the monitoring program, the EPA would be able to provide Whatcom County with a list of the properties that potentially require drinking well installation restrictions.

3.2 Analysis of Alternative 6

Overall protection of human health and the environment. Alternative 6 would be protective of human health and the environment. The source of contamination in excavated areas would be removed, reducing the potential for direct contact and the possibility of further groundwater contamination. The relatively low levels of groundwater contamination that currently exist would decrease through natural attenuation; groundwater monitoring would provide a mechanism to confirm that this is occurring. Placing restrictions on groundwater use would provide an additional layer of protection to the public by reducing the risk associated with the ingestion exposure route.

By capping the other contaminated areas, Alternative 6 is expected to control the contaminant source and reduce the risk of direct contact with contaminated soil. Shallow groundwater represents a relatively small fraction of the total mass of contaminants; residual contaminated groundwater would be reduced through natural attenuation, including dispersion. The deep aquifer is minimally contaminated and would also be addressed by natural attenuation and groundwater restrictions. Although capping leaves existing contamination in place, the RAOs would be met and risk to human health and the environment would be reduced to acceptable levels as defined by the EPA; groundwater monitoring would provide a mechanism to confirm that this is occurring.

Compliance with applicable or relevant and appropriate requirements (ARARs). Potential action-specific ARARs for capping and excavation are presented in Tables 4-4 and 4-6 of the FS, respectively (E & E 2002). This alternative would comply with the requirements set forth in RCRA, MTCA, and Washington State Dangerous Waste regulations. This alternative also would comply with United States Department of Transportation requirements for packaging and shipping hazardous wastes to off-facility locations.

The installation of additional catch basins and diversion of surface water flow to the existing stormwater management system would increase the volume of discharge from the Oeser outfalls. Therefore, the existing National Pollutant Discharge Elimination System (NPDES) permit may require updating. This permit is managed by Washington State Department of Ecology (Ecology) and the City of Bellingham.

Washington State's Model Toxics Control Act (MTCA) requires compliance monitoring for all cleanup actions with the development of a compliance monitoring plan. Compliance monitoring would serve two purposes: performance monitoring to confirm that the cap prevents further infiltration of precipitation and concomitant leaching of contaminants present in subsurface soil and shallow groundwater to the deep aquifer, and confirmation monitoring to confirm that CULs are attained for the long-term. In addition, use restrictions for groundwater also would be implemented through a restrictive covenant to prevent future use of groundwater underlying Oeser for drinking water. Any new wells installed would need to comply with Ecology's standards for well construction and maintenance.

Soil excavation activities would require the classification of wastes. RCRA and Washington State Dangerous Waste regulations provide guidelines for classification, transport, and disposal of hazardous and solid wastes.

Compliance monitoring and institutional controls for deep groundwater also would be required under MTCA. Monitoring would confirm that excavation of facility soils has removed the potential for further contaminant leaching to the deep groundwater aquifer, while use restrictions would ensure that the deep groundwater is not used for consumption by humans. Additional wells that might be installed for compliance monitoring activities would need to comply with Ecology's requirements for well construction and maintenance.

Long-term effectiveness and permanence. Excavation and off-site disposal provides a permanent resolution to the issues of direct contact and contaminant migration. The absence of a contaminant source also would provide protection of groundwater quality. Groundwater use restrictions also would provide long-term protection from the potential exposure to contaminated groundwater. Long-term groundwater monitoring would be conducted to confirm that the RAOs would continue to be met through this alternative.

Capping also is expected to be effective for the long term. As long as the integrity of the cap is maintained, existing contamination is not expected to migrate and direct contact with contaminated soil would be minimized. By removing the primary transport mechanism for groundwater contamination, deep groundwater quality should be protected. It is recommended that regular inspections and periodic application of surface treatments be conducted to prevent damage and to fill cracks. Additionally, resurfacing may be required every five years based on best professional judgement. Operational use restrictions on the cap would also be necessary to preserve the integrity of the cap and to ensure long-term protection of human health and the environment.

Groundwater and land use restrictions also would provide long-term protection from the potential exposure to contaminated groundwater. Long-term groundwater monitoring would provide assurance that the RAOs would continue to be met through this alternative.

Reduction of toxicity, mobility, or volume through treatment. Alternative 6 reduces the volume and mobility of soil contamination but not through treatment. Excavation would achieve removal of some of the contaminated sources from the site thereby reducing the volume of soil contamination at the site. The potential for contaminant mobility to groundwater would be reduced because of the removal of some of the source areas. This alternative does not include direct treatment of contaminated groundwater; however, groundwater contaminant levels should decrease through natural attenuation.

Capping is expected to control the contaminant source by significantly reducing precipitation infiltration, which facilitates the migration of groundwater contamination. Although some contaminants would remain in place, by reducing infiltration of precipitation, the mobility of existing contamination also would be reduced. The mobility of NAPL, if present, also would be reduced by preventing the infiltration of precipitation. It is critical to maintain the structural integrity of the cap in order to facilitate the continued effectiveness of this alternative. The removal and off-site incineration of NAPL, if necessary, would reduce contaminant volume and toxicity. This alternative does not include direct remedial measures for existing groundwater contamination. However, contaminant concentrations in the groundwater are relatively low and would be expected to decrease through natural attenuation processes.

Short-term effectiveness. Excavation of contaminated soil and installation of a cap would require careful attention to health and safety protocols and work plans to protect workers and the environment. Upon completion, the action would be very effective at removing the contaminant source. During excavation and cap installation, dust generation, noise, and an increase in truck traffic would be expected to impact the surrounding community and the environment. Dust generation could be controlled through the use of water spray. Limited work hours and exhaust mufflers could be employed to minimize noise impacts. It is estimated that excavation and cap installation activities would require approximately one month to conduct once design activities were completed.

Implementability. The use of heavy equipment and trained operators would be required to implement this alternative. Implementability of institutional controls for deep groundwater for The Oeser Company property would depend on the cooperation of the property owner, as discussed in Alternative 2 of the FS (E & E 2002).

Capping is an easily implemented technology and the resources required to construct the cap are readily available. Because construction of the cap would disrupt facility activities temporarily, the construction schedule would have to be coordinated with The Oeser Company management to minimize this disruption. Groundwater monitoring also could be easily implemented, given that it has been conducted at the site in the past and the equipment is readily available.

The implementability of property use restrictions would depend on the cooperation of the property owners. No materials are required and the process can be completed within a short time frame, provided that all parties agree that a restriction should be placed on the property.

Cost. The total estimated capital cost associated with this alternative is approximately $2,700,000. Costs included and assumptions made in this estimate are detailed in Attachment A along with the present worth analysis. Annual O&M costs for this alternative are estimated to be $1,013,000 per year for 30 years and include the cost of environmental monitoring activities. A cost of $25,000 is included every fifth year for the 5-year Comprehensive Environmental Response, Compensation, and Liability Act of 1980 review. The present worth of the annual costs is $1,013,000, and the total estimated present worth cost for Alternative 6 is $3,719,000.

4. COMPARATIVE ANALYSIS OF ALTERNATIVES ONE THROUGH SIX

In this section, the remedial alternatives are compared with one another using the threshold, primary balancing, and modifying criteria identified in the National Contingency Plan (NCP). The threshold criteria include protection of human health and the environment and compliance with ARARs. Because the threshold criteria must be met by all alternatives, these serve as the basic criteria for retaining an alternative. The primary balancing criteria include short- and long-term effectiveness; reduction of toxicity, mobility, or volume; implementability; and cost. Evaluation of the primary balancing criteria generally identifies the significant differences and important tradeoffs between alternatives. The modifying criteria, state and community acceptance, are not addressed in this document, but will be addressed by the EPA once the public comment period on the proposed plan is complete. The purpose of the evaluation presented below is to identify the relative advantages and disadvantages of each alternative to facilitate decision making. The comparative analysis results are summarized in Table 2.

4.1 Overall Protection of Human Health and the Environment

Alternative 1 would not satisfy the NCP threshold criteria for overall protection of human health and the environment. With respect to contaminated soil at the site, Alternatives 3 and 5 would be most protective of human health and the environment because all soil containing contaminants in excess of the CULs would be removed, significantly reducing the possibility of direct contact with contaminated soil and removing the source of potential future groundwater contamination. Alternatives 2, 4, and 6 also are protective with respect to the risks posed by contaminated soil. Alternatives 2, 4, and 6 would leave existing soil contamination in place but would achieve RAOs by reducing the potential for direct contact with contaminants and limiting contaminant mobility. Because several of the contaminated areas would be excavated under Alternative 6, it would be more protective of human health and the environment than Alternatives 2 and 4.

Alternatives 4 and 5 would be slightly more protective with respect to shallow groundwater contamination, but because the total mass of contamination in shallow groundwater is low relative to the mass in soil, the extraction and treatment of shallow groundwater would not significantly increase the overall protection to human health and the environment. Each of the five action alternatives include the same institutional controls for the deep groundwater and therefore would be equally protective in that respect.

The alternatives that would be most protective of human health and the environment overall in order from most protective to least protective are as follows: Alternative 3, Alternative 5, Alternative 6, Alternative 4, Alternative 2, and then Alternative 1.

4.2 Compliance with ARARs

Alternative 1 would not comply with ARARs. The five action alternatives would comply with ARARs and many of those requirements are common to the action alternatives. These five alternatives would also comply with the requirements set forth in RCRA, MTCA, and Washington State Dangerous Waste regulations. Alternatives 2, 4, and 6 also must comply with federal and state NPDES requirements associated with design and control of surface water flow, which are not included in the other alternatives. ARARs unique to Alternatives 3 and 5 include the Washington State Dangerous Waste regulations pertaining to the disposal of debris resulting from building demolition. Alternative 5 also includes Washington State Dangerous Waste regulations and RCRA requirements for land treatment.

Ongoing operations at The Oeser Company property would continue to be subject to all regulatory requirements governing such operations, including but not limited to RCRA, Washington States Dangerous Waste requirements, and NPDES requirements.

Each of the five action alternatives would require property and groundwater use restrictions. In the case of The Oeser Company’s property, restrictive covenants would be required.

In summary, with the exception of Alternative 1, all of the action alternatives would be equally compliant with ARARs.

4.3 Short-Term Effectiveness

There are more short-term impacts associated with Alternatives 3, 5, and 6 than Alternatives 2 and 4; although, all five action alternatives involve heavy equipment operation and increases in traffic, dust generation, and noise. Alternatives 3, 5, and 6 would require the development of extensive health and safety protocols to minimize the hazards associated with excavation and/or demolition. Because contaminated soil would remain on site under Alternative 5, the potential for direct exposure to the contaminated soil would remain until treatment is complete.

The estimated operational periods for each action alternative increase progressively. It is estimated that under Alternatives 2, 4, and 6 it would take one month to install the cap. Under Alternative 3, it is estimated that it would take three months to excavate; under Alternative 6, it is estimated that excavation would be completed in one month; and under Alternative 5 it is estimated that excavation would take four months and bioremediation would last approximately five years.

All of the action alternatives involve the use of heavy equipment; however, Alternatives 3, 5, and 6 would require more attention to health and safety protocols than Alternatives 2 and 4. In summary, short-term effectiveness associated with implementation of alternatives from the highest to the lowest are: Alternative 2, Alternative 4, Alternative 6, Alternative 3, Alternative 5, and then Alternative 1.

4.4 Long-Term Effectiveness and Permanence

Long-term effectiveness concerns two primary factors: the magnitude of the residual risk remaining from untreated contaminants and the risks remaining at the conclusion of remedial activities. Although natural attenuation of contaminated soil and groundwater would occur under Alternative 1, the risk levels associated with the site would not be reduced. Alternatives 3 and 5 would be more permanent and effective over the long-term than Alternatives 2 and 4 because instead of simply reducing contaminant mobility (Alternatives 2 and 4), the contamination would be removed. Alternative 6 would be less permanent and effective than 3 and 5, but more so than 2 and 4. The adequacy and reliability of caps are dependant on frequent inspection and proper maintenance. Thus, regular inspections and maintenance of the cap would be required under Alternatives 2, 4, and 6, but would not be required for excavation under Alternative 3 or for ex-situ treatment under Alternative 5. Shallow groundwater contamination would be addressed more effectively and permanently through Alternatives 4 and 5 (extraction and treatment) than through Alternatives 2, 3, and 6.

To summarize, the long-term effectiveness and permanence of the alternatives in order of most effective and permanent to the least are as follows: Alternative 3, Alternative 5, Alternative 6, Alternative 4, Alternative 2, and then Alternative 1.

4.5 Reduction of Toxicity, Mobility, or Volume Through Treatment

Except by the mechanism of natural attenuation, the toxicity, mobility, and volume of soil contamination would not be reduced through Alternative 1, and the potential for future migration of contaminants to groundwater would remain unchanged. The volume and mobility of soil contamination would be reduced significantly by Alternatives 2, 3, 4, and 6 but not through treatment. Alternatives 4 and 5 would reduce the toxicity, mobility, and volume of groundwater contamination through treatment. The only alternative that would reduce toxicity, mobility, and volume of both soil and groundwater contamination through treatment is Alternative 5. Under Alternative 5, some of the contaminated excavated soil would be biologically treated on-site.

4.6 Implementability

Alternative 1 requires no implementation. Alternatives 2 and 4 would be the easiest to implement. Although re-grading and drainage control may be required for Alternatives 2, 4, and 6, all the necessary equipment, materials, and contractors are readily available in the vicinity of the site. Coordination with The Oeser Company would be required to minimize disruption to the operation of the facility.

Alternatives 3 and 5 would require the Oeser Company to relocate the wood treating facilities to a different part of the site or to cease operations until the remedial construction is completed. If The Oeser Company facility shut down operations, it would be easier to implement Alternatives 3 and 5 but these alternatives would involve the use of heavy equipment over a longer period of time than the other alternatives. Additionally, the implementability of ex-situ bioremediation (Alternative 5) would need to be demonstrated during treatability testing. Although this technology has been effective at other sites with similar contaminants, the technology's site-specific effectiveness must be demonstrated by bench-scale and/or pilot-scale studies.

Alternative 6 would require some excavation and therefore is more difficult to implement than Alternatives 2 and 4, but more easily implementable than Alternatives 3 and 5.

With respect to implementability, the alternatives in order of the easiest to implement to the most difficult to implement are as follows: Alternative 2, Alternative 4, Alternative 6, Alternative 3, and then Alternative 5.

4.7 Cost

There are no costs associated with implementing Alternative 1. The capital cost and total present worth for Alternatives 2, 4, and 6 are similar and are the lowest of the action alternatives. The capital cost and total present worth of Alternative 5 are significantly higher than Alternatives 2 and 4, but are substantially less than the total capital cost and total present worth of Alternative 3.

Although the capital costs associated with Alternatives 2, 4, and 6 are the lowest of the action alternatives, the annual O&M costs and the annual O&M present worth are the highest of the five action alternatives. The increased O&M cost for Alternatives 2, 4, and 6 is due to the increased monitoring and maintenance activities associated with implementing the three alternatives. The annual O&M costs for Alternative 5 are higher than the O&M costs for Alternatives 2, 4, and 6 during treatment but decrease significantly after treatment of the excavated soil is complete. Because the annual O&M costs for Alternative 5 decrease substantially after completing treatment, the annual O&M present worth of Alternative 5 is less than the annual O&M present worth of Alternatives 2 and 4. The annual O&M cost and annual O&M present worth of Alternative 3 are the lowest of the action alternatives as only limited environmental monitoring is associated with the long-term operations of this alternative.

The overall present worth of each alternative is calculated by summing the capital cost and the annual O&M present worth. The total present worth for the other alternatives was calculated assuming 30 years of operation and maintenance and a discount rate of 5%. The alternatives with the lowest present worth to the highest are as follows: Alternative 1, Alternative 6, Alternative 2, Alternative 4, Alternative 5, and then Alternative 3.

4.8 Cost Sensitivity Analysis

A cost sensitivity analysis was performed to assess the effect that variations in assumptions would have on the estimated cost of Alternative 6. The factors with the highest degree of uncertainty, and therefore the greatest potential impact on overall costs, include variations in the estimated area to be capped and the estimated volume of soil to be excavated.

For Alternative 6, costs were developed assuming a 50% decrease in contaminated soil volume. Costs conservatively were developed based on the assumption that surface soil would require removal down to a depth of 6 inches. Surface soil samples were collected at a depth of 2 inches. Subsurface soil samples were collected at depths ranging from 0 to 48 feet below ground surface. Assuming that surface soil contamination extends to a depth of 3 inches instead of 6 inches, this would reduce the amount of soil requiring excavation by approximately 50%. A comparison of the impacts of this reduction in the amount of soil would have on the alternative is presented on Table 3. Costs included and assumptions made in this estimate are detailed in Attachment B along with the present worth analysis.

By reducing the contaminated soil volume, the capital cost decreases because the amount of excavation, loading, backfilling, transportation, and disposal decrease. However, the annual costs do not decrease because the cap would still require maintenance; groundwater monitoring still would be conducted; and NAPL removal also would take place. It should be noted that the number of confirmation samples would not decrease nor would the cost to re-vegetate the site. These costs are dependent on the size of the area to be excavated, and since the size of the area is not changing in this analysis, these costs do not change. It also should be noted that the level of groundwater monitoring effort would not change as a result of excavating soil from the outer areas. This is because a majority of the soil contamination that poses a risk to the groundwater is located in an area that is proposed for capping. Since soil in this area would not be removed, measures would be required to monitor the effectiveness of the cap in preventing the migration of soil contamination to the groundwater.

5. REFERENCE

Ecology and Environment, Inc. (E & E), August 2002, *The Oeser Company Superfund Site—Feasibility Study Report*, prepared for the United States Environmental Protection Agency.

Table 1

AREAS PROPOSED FOR CAPPING AND VOLUMES PROPOSED FOR EXCAVATION THE OESER COMPANY SUPERFUND SITE BELLINGHAM, WASHINGTON

Subarea	Subarea Size	Proposed Cap Size	Proposed Excavation Volume
North Pole Yard	8.53 acres	None	820 cubic yards
South Pole Yard	3.93 acres	None	870 cubic yards
Treated Pole Area	2.99 acres	None	1,300 cubic yards
North Treatment Area	4.53 acres	None	340 cubic yards
West Treatment Area	0.41 acres	0.06 acres	None
East Treatment Area	0.63 acres	0.05 acres	None
Wood Storage Area	4.59 acres	1.05 acres	40 cubic yards
Total	**25.61 acres**	**1.16 acres**	**3,370 cubic yards**

Table 2 (Revised Table 4-10)

COMPARATIVE ANALYSIS SUMMARY
THE OESER COMPANY SUPERFUND SITE
BELLINGHAM, WASHINGTON

Criterion	Alternative 1: No Action	Alternative 2: Capping	Alternative 3: Excavation	Alternative 4: Capping and Ex-Situ Groundwater Treatment	Alternative 5: Ex-Situ Soil and Groundwater Treatment	Alternative 6: Capping and Excavation
Overall Protection of Human Health and the Environment	Not protective	Protective	Protective	Protective	Protective	Protective
Compliance with ARARs	No	Yes	Yes	Yes	Yes	Yes
Long-Term Effectiveness and Permanence	Not Effective	Effective	Effective	Effective	Effective	Effective
Reduction of Toxicity, Mobility, or Volume through Treatment	None	No Treatment	No Treatment	No treatment for soil contamination. Some reduction in toxicity, mobility, and volume of groundwater contamination through treatment.	Some reduction in toxicity and volume of soil and groundwater contamination through treatment.	No Treatment
Short-Term Effectiveness	Not applicable	Effective	Moderately effective	Effective	Moderately effective	Effective
Implementability	Easily implemented	Easily implemented	Not implementable with current land use	Moderately implementable	Not implementable with current land use	Implementable
Present Worth Cost	No additional costs	$4.2 million	$13.7 million	$4.5 million	$7.2 million	$3.7 million

Key:

ARARs = Applicable or relevant and appropriate requirements.

Table 3 (Revised Table 4-11)

SUMMARY OF SENSITIVITY ANALYSIS EVALUATION
THE OESER COMPANY SUPERFUND SITE
BELLINGHAM, WASHINGTON

Sensitivity Analysis Factor	**Alternative 2: Capping**		**Alternative 3: Excavation**		**Alternative 4: Capping and Ex-Situ Groundwater Treatment**		**Alternative 5: Ex-Situ Soil and Groundwater Treatment**		**Alternative 6: Capping and Excavation**	
No Change	Total Present Worth:	$4,177,000	Total Present Worth:	$13,717,000	Total Present Worth:	$4,524,000	Total Present Worth:	$7,155,000	Total Present Worth:	$3,719,000
	Present Worth Annual Costs:	$1,300,000	Present Worth Annual Costs:	$236,000	Present Worth Annual Costs:	$1,300,000	Present Worth Annual Costs:	$564,000	Present Worth Annual Costs:	$1,013,000
30% Increase in Cap Size (Alternative 2)/30% Increase in Soil Volume (Alternative 3)/50% Decrease in Soil Volume (Alternative 3A)	Total Present Worth:	$4,854,000	Total Present Worth:	$17,590,000	Total Present Worth:	$5,202,000	Total Present Worth:	$8,480,000	Total Present Worth:	$3,184,000
	Present Worth Annual Costs:	$1,414,000	Present Worth Annual Costs:	No Change	Present Worth Annual Costs:	$1,414,000	Present Worth Annual Costs:	$661,000	Present Worth Annual Costs:	$1,013,000
Cost Increase	Total Present Worth:	$677,000	Total Present Worth:	$3,873,000	Total Present Worth:	$678,000	Total Present Worth:	$1,325,000	Total Present Worth:	$-535,000
	Present Worth Annual Costs:	$114,000	Present Worth Annual Costs:	No Change	Present Worth Annual Costs:	$114,000	Present Worth Annual Costs:	$97,000	Present Worth Annual Costs:	No Change
Percent Increase in Cost	Total Present Worth:	16%	Total Present Worth:	28%	Total Present Worth:	15%	Total Present Worth:	18%	Total Present Worth:	-14%
	Present Worth Annual Costs:	9%	Present Worth Annual Costs:	No Change	Present Worth Annual Costs:	9%	Present Worth Annual Costs:	17%	Present Worth Annual Costs:	No Change

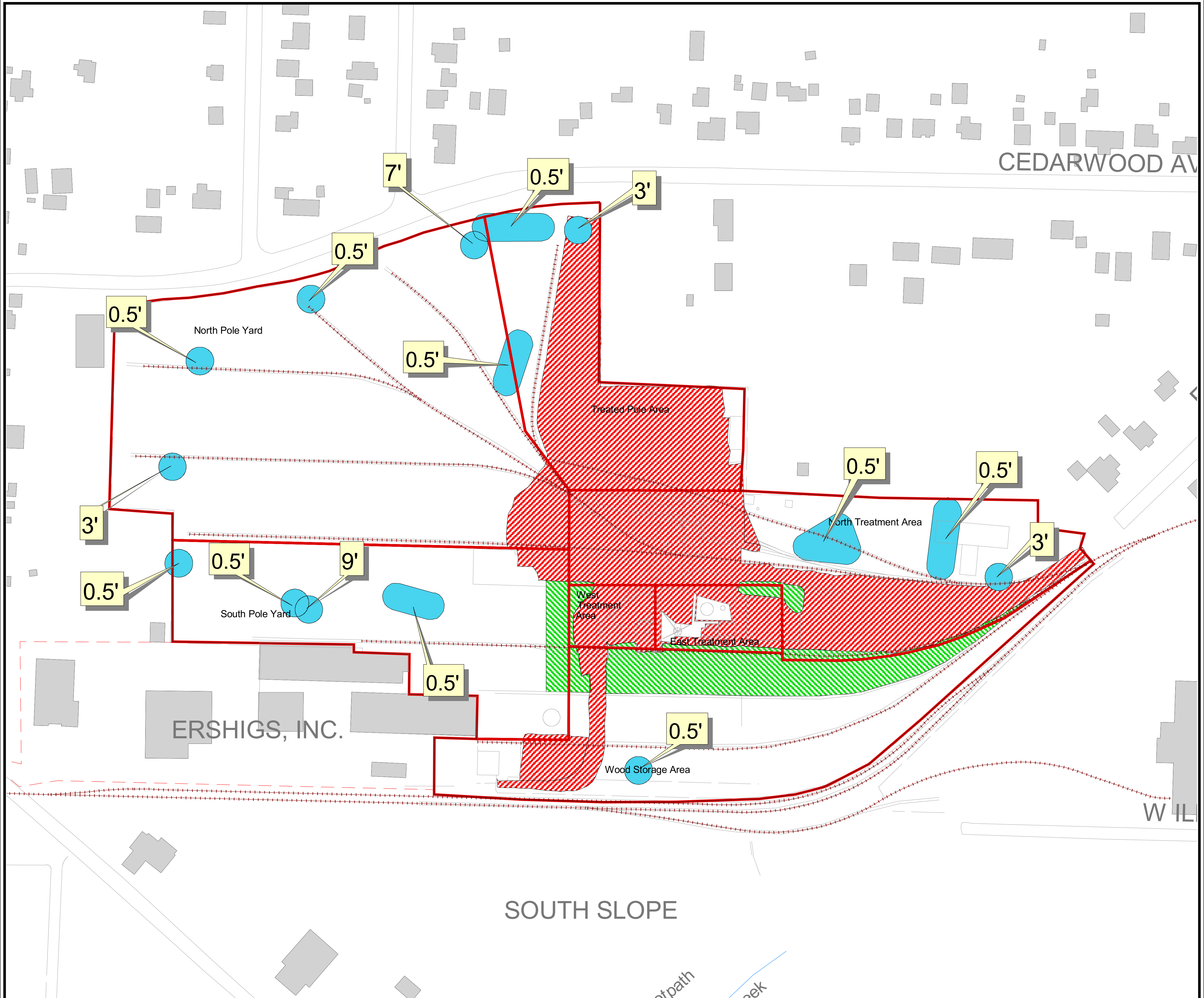

Figure 1

THE OESER COMPANY
SUPERFUND SITE

Bellingham, Washington

Areas Proposed for
Excavation and Capping

Legend

- Railroad
- Oeser Facility Areas
- Oeser Facility Layout
- Buildings

Proposed Remedy

- Proposed Capping
- Proposed Excavation
- Existing Asphalt
- 0.5' Excavation Depth in Feet

N W E S

100 0 100 200 300 Feet

ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

Table 4-1 (Revised October 2002)

RETAINED REMEDIAL ALTERNATIVES
THE OESER COMPANY SUPERFUND SITE
BELLINGHAM, WASHINGTON

Alternative 1	No Action
Alternative 2	Capping
Alternative 3	Soil Excavation
Alternative 4	Capping and Ex-Situ Groundwater Treatment
Alternative 5	Ex-Situ Soil and Groundwater Treatment
Alternative 6	Capping and Soil Excavation

Table 4-9 (Revised October 2002)

SUMMARY OF ALTERNATIVE COSTS
THE OESER COMPANY SUPERFUND SITE
BELLINGHAM, WASHINGTON

	Capital Cost	Average Annual Cost	Present Worth of Annual Costs	Total Present Worth
Alternative 1	$0	$0	$0	$0
Alternative 2	$ 2,876,800	$93,000	$1,300,000	$4,177,000
Alternative 3	$13,481,000	$14,600	$236,000	$13,717,000
Alternative 4	$3,224,500	$93,000	$1,300,000	$4,524,000
Alternative 5	$6,591,000	$27,120	$564,000	$7,155,000
Alternative 6	$2,700,000	$71,000	$1,013,000	$3,719,000

ATTACHMENT A

A. ASSUMPTIONS USED IN THE ALTERNATIVE 6 COST ESTIMATE

The costs provided in this attachment to *The Oeser Company Superfund Site—Feasibility Study Report* are estimates and are provided primarily for the purpose of comparing remedial alternatives during the remedy selection process, not for establishing project budgets. Because a detailed design has not been developed for The Oeser Company Superfund site (Oeser), assumptions were made in order to obtain a cost for each alternative to present as part of the detailed analysis and comparative analysis. The assumptions made for this alternative are discussed in this attachment.

A.1 Cost Assumptions for Capping

A.1.1 Capital Costs

Costs associated with the capping element of this alternative are assumed to be similar to the capping costs for Alternatives 2 and 4, presented in the feasibility study.

Potential paving contractors are available within close proximity to the site, therefore the mobilization and demobilization costs are considered minimal. Costs for mobilizing construction equipment and establishing a site office were included in the cost estimate.

Capital costs associated with capping include the cost of materials associated with improving the existing cap, installing a new cap, and drainage improvements. Capital costs also include direct and indirect costs such as project management, engineering and design, construction oversight, and legal fees. The total amount of existing asphalt at the site that may require improvement to meet requirements of a RCRA Subtitle C cover is approximately 6 acres; this number was used to determine the costs for cap improvements. The proposed improvement to the existing caps include adding an impermeable fluid-applied membrane layer, an additional layer of asphalt, and three coats of sealant. The elements of the cap improvement are as follows (from top surface down): three coats of surface sealant, 3-inch layer of Class B environmental asphalt concrete pavement (EACP), Petromat geotextile, cold-spray-applied fluid membrane, then another layer of geotextile on top of the existing asphalt. The bottom layer of geotexitle would be applied to the existing asphalt using a tack coat. The composition of these layers may change during the design phase once a detailed engineering analysis is performed.

Based on contamination information from the remedial investigation, it is estimated that approximately 1.16 acres at the site will require additional capping. Capital costs for the additional capping were developed based on this number. One possible suggested design of the multilayer cap system would consist of (from the top surface down): a 3-inch layer of Class B EACP, Petromat geotextile, cold-spray-applied fluid membrane, another layer of geotextile applied to a 3-inch layer of Class B EACP wearing course, paving fabric, a low permeability 3-inch EACP layer, a 2-inch asphalt stabilized top course layer, a 10-inch crushed rock base course followed by a layer of geotextile that overlays the native ground or backfill materials. Three coats of sealants would be applied on the final asphalt surface to help maintain the structural integrity of the surface. The thickness and composition of these layers may change during the design phase once a detailed engineering analysis is performed.

For the drainage improvements, it was assumed that a water-tight catch basin would be installed in the proposed area to be capped then stormwater runoff would be conveyed to the stormwater treatment system through water-tight High Density Polyethylene piping then discharged in accordance with The Oeser Company's National Pollutant Discharge Elimination System (NPDES) permit.

Excavation and/or re-grading to accommodate the design thickness of the paving system increases the cost of construction significantly, especially if the excavated soil requires off-site disposal at a Resource Conservation and Recovery Act (RCRA) Subtitle C landfill. However, it is unlikely that excavation to accommodate design thickness of the paving system would be necessary at The Oeser Company facility because the conditions present are conducive to paving without much preparation.

A.1.2 Operation and Maintenance (O&M) Costs

O&M costs include the cost to patch and maintain the structural integrity of the cap. Maintenance costs provided in the cost estimate include the cost to patch and repair the asphalt concrete paving layer and the paving fabric over the life of the project. It is assumed in the estimate that 3% of the cap would require patching annually for the first 10 years, then 6% of the patch course would require patching annually for the next 10 years, then 10% patching per year is assumed for the last 10 years of the project. Additional maintenance costs include applying top seal coating to the capped areas once every two years for the duration of the project.

A.2 Cost Assumptions for Excavation

A.2.1 Capital Costs

For Alternative 6, it is assumed that approximately 3,400 cubic yards of contaminated soil will be excavated and these areas will be backfilled with clean soil. Once the areas were backfilled, they would then be covered with a 6-inch layer of topsoil and seeded for erosion control.

Contaminated soil excavated during the 1997 to 1998 Removal Action was transported by railway to the Envirosafe Services of Idaho landfill located in Grand View, Idaho. In this cost estimate, it was assumed that all contaminated soil excavated as part of the remedial action would be transported by railway to the US Ecology Idaho landfill (formerly Environsafe Services of Idaho) in Grand View, Idaho. The US Ecology Idaho landfill is a RCRA Subtitle C landfill.

An important aspect of this alternative is the confirmation that all soil contamination above the cleanup levels has been removed from the site. Confirming removal of contamination is done by collecting confirmation samples. Under this alternative, it is assumed that a sampling crew consisting of two people would be on site eight hours per week for four weeks. An additional 40 hours is added to this estimate for mobilization/demobilization activities. It was assumed that a total of 25 samples would be collected under this alternative. All confirmation samples would be submitted to a commercial laboratory for dioxin and semivolatile organic compound (SVOC) analysis with a standard turnaround time[1]. It was assumed that one cooler would hold 10 soil samples and weigh 60 pounds. For quality assurance/quality control (QA/QC) review and reporting, it was assumed that it would take eight hours to review the results of 20 samples.

A.2.2 O&M Costs

Discussion of O&M costs associated with excavation is not applicable because once excavation is complete and the areas are backfilled, no further actions are required to maintain the area.

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[1] Standard turnaround time typically is two weeks for verbal results and four weeks for hard copy results. Expediting sample turnaround time at a commercial laboratory can increase the per sample analytical cost by as much as 100% but waiting for analytical results during the excavation can increase the project length, and thus the overall project cost. Use of a mobile laboratory to analyze soil samples for SVOCs may be warranted in order to expedite sample turnaround time; however, soil samples cannot be analyzed for dioxin in a mobile laboratory.

A.3 Cost Assumptions for Shallow and Deep Groundwater Monitoring

A.3.1 Capital Costs

There are no capital costs associated with monitoring shallow or deep groundwater at the site.

A.3.2 O&M Costs

Shallow Groundwater Monitoring. Under this alternative, monitoring would be conducted to track contamination in shallow groundwater.

For cost estimating purposes, monitoring for NAPL is assumed to take place twice annually for the life of the project. It is anticipated that a two-person crew would spend one day at the site, twice a year, monitoring for the presence of NAPL; removing and replacing oil-absorbent material from wells suspected of containing NAPL, and properly disposing of the used absorbent material.

Shallow groundwater sampling is assumed to take place twice a year for the first five years of the project, then occur once a year until the end of the project. For the cost estimate, it is assumed that a two-person crew would collect shallow groundwater samples from six wells and submit them for SVOC and dioxin analysis with standard turnaround time. QA/QC review and reporting is assumed to take eight hours per 20 samples. Sample shipment costs were determined by assuming that each cooler holds five water samples and weighs 60 pounds. Combining shallow groundwater monitoring events with the deep groundwater monitoring events, it is estimated that each sampling event for Alternative 6 would last a total of two eight-hour days including time to mobilize and demobilize.

Deep Groundwater Monitoring. For this alternative, deep groundwater samples would be collected during the shallow groundwater monitoring events.

Deep groundwater monitoring for Alternative 6 would consist of collecting samples from six wells and submitting the samples for dioxin and SVOC analysis with standard turnaround time. Deep groundwater monitoring would occur twice a year for the first five years then would occur once per year for the life of the project.

ATTACHMENT B

PRESENT WORTH ANALYSIS

ALTERNATIVE 6: CAPPING & EXCAVATION
THE OESER COMPANY SUPERFUND SITE
BELLINGHAM, WASHINGTON

Year	Cost Factor	Capital	Annual NAPL Removal	Cap Maintenance	Replace Top Seal Coat	Environmental Monitoring	CERCLA Review	Total Annual Costs	Discounted Annual Costs
0	1	$ 2,706,400						$ 2,706,400	$ 2,706,400
1	0.952		$ 2,500	$ 18,140		$ 33,200		$ 53,840	$ 51,276
2	0.907		$ 2,500	$ 18,140	$ 12,100	$ 33,200		$ 65,940	$ 59,810
3	0.864		$ 2,500	$ 18,140		$ 33,200		$ 53,840	$ 46,509
4	0.823		$ 2,500	$ 18,140	$ 12,100	$ 33,200		$ 65,940	$ 54,249
5	0.784		$ 2,500	$ 18,140		$ 33,200	$ 25,000	$ 78,840	$ 61,773
6	0.746		$ 2,500	$ 18,140	$ 12,100	$ 16,600		$ 49,340	$ 36,818
7	0.711		$ 2,500	$ 18,140		$ 16,600		$ 37,240	$ 26,466
8	0.677		$ 2,500	$ 18,140	$ 12,100	$ 16,600		$ 49,340	$ 33,395
9	0.645		$ 2,500	$ 18,140		$ 16,600		$ 37,240	$ 24,005
10	0.614		$ 2,500	$ 18,140	$ 12,100	$ 16,600	$ 25,000	$ 74,340	$ 45,638
11	0.585		$ 2,500	$ 36,100		$ 16,600		$ 55,200	$ 32,274
12	0.557		$ 2,500	$ 36,100	$ 12,100	$ 16,600		$ 67,300	$ 37,475
13	0.530		$ 2,500	$ 36,100		$ 16,600		$ 55,200	$ 29,274
14	0.505		$ 2,500	$ 36,100	$ 12,100	$ 16,600		$ 67,300	$ 33,991
15	0.481		$ 2,500	$ 36,100		$ 16,600	$ 25,000	$ 80,200	$ 38,578
16	0.458		$ 2,500	$ 36,100	$ 12,100	$ 16,600		$ 67,300	$ 30,831
17	0.436		$ 2,500	$ 36,100		$ 16,600		$ 55,200	$ 24,084
18	0.416		$ 2,500	$ 36,100	$ 12,100	$ 16,600		$ 67,300	$ 27,965
19	0.396		$ 2,500	$ 36,100		$ 16,600		$ 55,200	$ 21,845
20	0.377		$ 2,500	$ 36,100	$ 12,100	$ 16,600	$ 25,000	$ 92,300	$ 34,787
21	0.359		$ 2,500	$ 60,340		$ 16,600		$ 79,440	$ 28,514
22	0.342		$ 2,500	$ 60,340	$ 12,100	$ 16,600		$ 91,540	$ 31,293
23	0.326		$ 2,500	$ 60,340		$ 16,600		$ 79,440	$ 25,863
24	0.310		$ 2,500	$ 60,340	$ 12,100	$ 16,600		$ 91,540	$ 28,384
25	0.295		$ 2,500	$ 60,340		$ 16,600	$ 25,000	$ 104,440	$ 30,841
26	0.281		$ 2,500	$ 60,340	$ 12,100	$ 16,600		$ 91,540	$ 25,745
27	0.268		$ 2,500	$ 60,340		$ 16,600		$ 79,440	$ 21,278
28	0.255		$ 2,500	$ 60,340	$ 12,100	$ 16,600		$ 91,540	$ 23,351
29	0.243		$ 2,500	$ 60,340		$ 16,600		$ 79,440	$ 19,300
30	0.231		$ 2,500	$ 60,340	$ 12,100	$ 16,600	$ 25,000	$ 116,540	$ 26,965
								Present Worth	**$ 3,719,000**
								Present Worth of Annual Costs	**$ 1,013,000**

Cost Worksheet

Alternative: 6
Element: Capping & Excavation

Site: The Oeser Company Superfund Site
Location: Bellingham, Washington
Phase: Feasibility Study (-30% to +50%)
Base Year: 2002

Work Statement:

This alternative involves surface and subsurface excavation and installing a multilayer cap to prevent direct contact with contaminated surfaces soils and prevent the vertical migration of contaminants by inhibiting stormwater infiltration. The proposed cap consists of (from top to bottom): 3 coats of seal coating, a 3-inch layer of Class B Asphalt Concrete Paving, cold-spray applied membrane and geotextile, another 3-inch layer of Class B Asphalt Concrete Paving, paving fabric, a 3-inch layer of environmental asphalt concrete paving, a 2-inch asphalt stabilized top course layer, a 10-inch crushed rock base placed on top of geotextile that overlies the native soil. This alternative also includes the excavation and off-site disposal of contaminated soil from the areas around the site where treated wood is not handled. Excavated soil will be shipped off site to a RCRA Subtitle C landfill. All construction and monitoring work will be conducted in Level D PPE.

Description	Unit Cost		Unit	Qty	Total		Notes/References
CAPITAL COSTS							
Mobilization/Demobilization							
Construction equipment	$	500	LS	1	$	500	Engineering Estimate
Temporary Office 32'X8'	$	239.68	mo	2	$	479	RSERCD 2002 99 14 0102
Temporary Storage Trailer 28'X10'	$	106.40	mo	2	$	213	RSERCD 2002 99 14 0202
Temporary Utilities & Hookups	$	300	mo	2	$	600	Engineering Estimate
Capping							
Existing Cap Improvements							
Seal Coating (3 coats) 0.28/sy each	$	0.84	sy	28,943	$	24,312	RSERCD 2002 18 01 0311
Asphalt Concrete 3" Wearing Course	$	6.75	sy	28,943	$	195,367	Vendor Quote 1
Cold-spray Applied Membrane and Fabric	$	11.70	sy	28,943	$	338,635	Note 1/Vendor Quote 2
Tack Coat	$	0.29	sy	28,943	$	8,394	RSERCD 2002 18 01 0311
Additional Capping							
Seal Coating (3 coats) 0.28/sy each	$	0.84	sy	5,624	$	4,724	RSERCD 2002 18 01 0311
Asphalt Concrete 3" Wearing Course	$	6.75	sy	5,624	$	37,963	Vendor Quote 1
Cold-spray Applied Membrane and Fabric	$	11.70	sy	5,624	$	65,802	Note 1/Vendor Quote 2
Tack Coat	$	0.29	sy	5,624	$	1,631	RSERCD 2002 18 01 0311

Cost Worksheet

Alternative: 6
Element: Capping & Excavation

Site: The Oeser Company Superfund Site
Location: Bellingham, Washington
Phase: Feasibility Study (-30% to +50%)
Base Year: 2002

Description	Unit Cost	Unit	Qty	Total	Notes/References
Asphalt Concrete 3" Wearing Course	$ 6.75	sy	5,624	$ 37,963	Vendor Quote 1
Paving Fabric	$ 2.00	sy	5,624	$ 11,248	Vendor Quote 1
3" Environmental Asphalt Concrete Paving	$ 9.39	sy	5,624	$ 52,810	RSERCD 2002 18 01 0312
2" Asphalt Stabilized Base Course	$ 1.85	sy	5,624	$ 10,405	RSERCD 2002 18 01 0105
10" Crushed Gravel Base	$ 6.60	sy	5,624	$ 37,119	RSERCD 2002 18 01 0102
6 oz. Non-Woven Geotextile	$ 1.06	sy	5,624	$ 5,962	RSERCD 2002 33 08 0531
Drainage Improvements over Capping Areas					
Wood Storage Area:					
Area drains with grates, 6' deep	$ 2,450	ea	1	$ 2,450	RSERCD 2002 18 02 0202
8" dia., Corrugated HDPE Type S piping with gaskets	$ 6.00	lf	500	$ 3,000	RSSWLCD 2002 02600 1020
Excavation and Loading					
Excavate All Areas	$ 2.20	cy	3,370	$ 7,414	Note 2/Vendor Quote 1
Digital Dust Sampler, Monthly Rental	$ 850	mo	6	$ 5,100	Note 3/RSERCD 2002 33 02 0312
Backfill					
Haul, Place, and Compact	$ 13.60	cy	3,370	$ 45,832	Note 2/Vendor Quote 1
Topsoil, 6" lifts, off-site source	$ 25.32	cy	1,996	$ 50,539	RSERCD 2002 18 05 0301
Seeding, Vegetative Cover	$ 3,480	acre	2	$ 8,352	RSERCD 2002 18 05 0402
Transportation & Disposal					
Excavated Soil	$ 110	ton	5,141	$ 565,500	Note 4/Vendor Quote 3
Confirmation Sampling					
Sampling Crew	$ 150	hrs	104	$ 15,600	Engineering Estimate
Dioxin Analysis (EPA 8290), Std Turnaround, Std. QC, soil	$ 740	sample	25	$ 18,500	Vendor Quote 4
Base, Neutral, Acid (EPA 8270C), Std Turnaround, Std. QC, soil	$ 253	sample	25	$ 6,325	Vendor Quote 5
Sampling Supplies	$ 20.00	sample	25	$ 500	Engineering Estimate
Sample Shipment	$ 2.08	lb	150	$ 312	RSERCD 2002 33 02 2043
QA/QC Review and Reporting	$ 50.20	hr	10	$ 502	RSERCD 2002 33 22 0110
Capital Cost Subtotal:				**$ 1,564,100**	

Cost Worksheet

Alternative: 6
Element: Capping & Excavation

Site: The Oeser Company Superfund Site
Location: Bellingham, Washington
Phase: Feasibility Study (-30% to +50%)
Base Year: 2002

Description	Unit Cost	Unit	Qty	Total	Notes/References
Direct Capital Costs					
Total Construction cost				$ 1,564,100	
Subcontracting Overhead			10%	$ 156,410	Engineering Estimate
Bid and Scope Contingency (15% + 15%)			30%	$ 516,153	Engineering Estimate
Total Direct Capital Costs (rounded to $100)				**$ 2,236,700**	
Indirect Capital Costs					
Legal Fees and License/Permit Costs			1%	$ 22,367	Engineering Estimate
Engineering and Design			6%	$ 134,202	EPA 2000
Project Management			5%	$ 111,835	EPA 2000
Contractor Reporting Requirements			3%	$ 67,101	Engineering Estimate
Construction Oversight			6%	$ 134,202	EPA 2000
Total Indirect Capital Costs (Rounded to $100)				**$ 469,700**	
TOTAL CAPITAL COSTS:				**$ 2,706,400**	

Description	Unit Cost	Unit	Qty	Total	Notes/References
OPERATIONS & MAINTENANCE COSTS					
Institutional Controls					
Total Annual Monitoring Cost for Years 1-5	$ 33,200	year	1	$ 33,200	See Capping Alternative Groundwater Monitoring Cost Worksheet
Total Annual Monitoring Cost for Years 6 - 30	$ 16,600	year	1	$ 16,600	See Capping Alternative Groundwater Monitoring Cost Worksheet

Cost Worksheet

Alternative: 6
Element: Capping & Excavation

Site: The Oeser Company Superfund Site
Location: Bellingham, Washington
Phase: Feasibility Study (-30% to +50%)
Base Year: 2002

Description	Unit Cost	Unit	Qty	Total	Notes/References
Repairs & Maintenance					
Top seal coating - once every 2 yrs	$ 0.35	sy	34,558	$ 12,100	RSERCD 2001 18 01 0310
Patching ACPs & Paving Fabric 3% annually	$ 17.44	sy	1,040	$ 18,140	Vendor Quote 1; Years 1 to 10
Patching ACPs & Paving Fabric 6% annually	$ 17.44	sy	2,070	$ 36,100	Vendor Quote 1; Years 11 to 20
Patching ACPs & Paving Fabric 10% annually	$ 17.44	sy	3,460	$ 60,340	Vendor Quote 1; Years 21 to 30
NAPL Removal					
Crew	$ 150	hr	16	$ 2,400	Engineering Estimate
Oil-only SOC (flexible absorbent tube)	$ 48.18	case	1	$ 48.18	Note 5/Vendor Quote 6
Disposal of absorbent material	$ 0.36	lb	44	$ 15.84	Note 6/Vendor Quote 7
Annual NAPL Removal Costs				**$ 2,500**	

Cost Worksheet

Alternative: 6
Element: Capping & Excavation

Site: The Oeser Company Superfund Site
Location: Bellingham, Washington
Phase: Feasibility Study (-30% to +50%)
Base Year: 2002

Notes

Note 1	This layer consists of (from top to bottom): Petromat (a geotextile), cold-spray-applied membrane, and another layer of geotextile.
Note 2	Includes labor, equipment, materials, and mob/demob
Note 3	Assumes the rental of 2 units for 3 months.
Note 4	Includes delivery of empty gondola cars, tarps and liners, transportation by rail from Bellingham, WA to final disposal facility in Grand View, ID, tracking of shipments, direct disposal at the disposal facility, and tax. Weight of soil estimated to be 113 pounds per cubic foot.
Note 5	Oil-only SOC is 3" by 12' and absorbs 12 gallons/11 pounds of oil. Each case contains 4 absorbent booms.
Note 6	Cost is for incineration. Unit cost of $0.12/lb was tripled to reflect extra cost incurred by not meeting BTU values.

References

EPA 2000	U.S Environmental Protection Agency, July 2000, *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study* , EPA 540/R/00/002.
RSERCD	RS Means, 2002, *Environmental Remediation Cost Data, 8th Annual Edition* , Environmental Cost Handling Options and Solutions LLC.
RSSWLCD	RS Means, 2002, *Site Work & Landscape Cost Data, 21st Annual Edition* , Environmental Cost Hanling Options and Solutions LLC.
Vendor Quote 1	Bert Hanson, Wilder Construction, Bellingham, Washington [(360) 676-2450]
Vendor Quote 2	LBI Technologies, Inc., Anaheim, California [(714) 384-0111]
Vendor Quote 6	Air Gas Direct Industrial Safety Products, Bristol, Pennsylvania [(800) 827-2338]
Vendor Quote 7	Rainer Elias, Philip Service Corporation, Redmond, Washington [(425) 227-0311]
Vendor Quote 3	Steve Welling, US Ecology Idaho, Grandview, Idaho [(916) 939-0967]
Vendor Quote 4	Michael King, Pace Analytical, Minneapolis, Minnesota [(612) 607-1700]
Vendor Quote 5	Mingta Lin, Columbia Analytical Services, Kelso, Washington [(360) 577-7222]

PRESENT WORTH COSTS/SENSITIVITY ANALYSIS

ALTERNATIVE 6: CAPPING & EXCAVATION
THE OESER COMPANY SUPERFUND SITE
BELLINGHAM, WASHINGTON

Year	Cost Factor	Capital	Annual NAPL Removal	Cap Maintenance	Replace Top Seal Coat	Environmental Monitoring	CERCLA Review	Total Annual Costs	Discounted Annual Costs
0	1	$ 2,171,000						$ 2,171,000	$ 2,171,000
1	0.952		$ 2,500	$ 18,140		$ 33,200		$ 53,840	$ 51,276
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14	0.505		$ 2,500	$ 36,100	$ 12,100	$ 16,600		$ 67,300	$ 33,991
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22	0.342		$ 2,500	$ 60,340	$ 12,100	$ 16,600		$ 91,540	$ 31,293
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25	0.295		$ 2,500	$ 60,340		$ 16,600	$ 25,000	$ 104,440	$ 30,841
26	0.281		$ 2,500	$ 60,340	$ 12,100	$ 16,600		$ 91,540	$ 25,745
27	0.268		$ 2,500	$ 60,340		$ 16,600		$ 79,440	$ 21,278
28	0.255		$ 2,500	$ 60,340	$ 12,100	$ 16,600		$ 91,540	$ 23,351
29	0.243		$ 2,500	$ 60,340		$ 16,600		$ 79,440	$ 19,300
30	0.231		$ 2,500	$ 60,340	$ 12,100	$ 16,600	$ 25,000	$ 116,540	$ 26,965
								Present Worth	**$ 3,184,000**
								Present Worth of Annual Costs	**$ 1,013,000**

Cost Worksheet

Alternative: 6

Element: Capping & Excavation
Sensitvity Analysis

Site: The Oeser Company Superfund Site

Location: Bellingham, Washington

Phase: Feasibility Study (-30% to +50%)

Base Year: 2002

Work Statement:

This alternative involves surface and subsurface excavation and installing a multilayer cap to prevent direct contact with contaminated surfaces soils and prevent the vertical migration of contaminants by inhibiting stormwater infiltration. The proposed cap consists of (from top to bottom): 3 coats of seal coating, a 3-inch layer of Class B Asphalt Concrete Paving, cold-spray applied membrane and geotextile, another 3-inch layer of Class B Asphalt Concrete Paving, paving fabric, a 3-inch layer of environmental asphalt concrete paving, a 2-inch asphalt stabilized top course layer, a 10-inch crushed rock base placed on top of geotextile that overlies the native soil. This alternative also includes the excavation and off-site disposal of contaminated soil from the areas around the site where treated wood is not handled. Excavated soil will be shipped off site to a RCRA Subtitle C landfill. All construction and monitoring work will be conducted in Level D PPE.

Description		Unit Cost	Unit	Qty		Total	Notes/References
CAPITAL COSTS							
Mobilization/Demobilization							
Construction equipment	$	500	LS	1	$	500	Engineering Estimate
Temporary Office 32'X8'	$	239.68	mo	2	$	479	RSERCD 2002 99 14 0102
Temporary Storage Trailer 28'X10'	$	106.40	mo	2	$	213	RSERCD 2002 99 14 0202
Temporary Utilities & Hookups	$	300	mo	2	$	600	Engineering Estimate
Capping							
Existing Cap Improvements							
Seal Coating (3 coats) 0.28/sy each	$	0.84	sy	28,943	$	24,312	RSERCD 2002 18 01 0311
Asphalt Concrete 3" Wearing Course	$	6.75	sy	28,943	$	195,367	Vendor Quote 1
Cold-spray Applied Membrane and Fabric	$	11.70	sy	28,943	$	338,635	Note 1/Vendor Quote 2
Tack Coat	$	0.29	sy	28,943	$	8,394	RSERCD 2002 18 01 0311
Additional Capping							
Seal Coating (3 coats) 0.28/sy each	$	0.84	sy	5,624	$	4,724	RSERCD 2002 18 01 0311
Asphalt Concrete 3" Wearing Course	$	6.75	sy	5,624	$	37,963	Vendor Quote 1
Cold-spray Applied Membrane and Fabric	$	11.70	sy	5,624	$	65,802	Note 1/Vendor Quote 2
Tack Coat	$	0.29	sy	5,624	$	1,631	RSERCD 2002 18 01 0311

Cost Worksheet

Alternative: 6
Element: Capping & Excavation
Sensitvity Analysis
Site: The Oeser Company Superfund Site
Location: Bellingham, Washington
Phase: Feasibility Study (-30% to +50%)
Base Year: 2002

Description		Unit Cost	Unit	Qty		Total	Notes/References
Asphalt Concrete 3" Wearing Course	$	6.75	sy	5,624	$	37,963	Vendor Quote 1
Paving Fabric	$	2.00	sy	5,624	$	11,248	Vendor Quote 1
3" Environmental Asphalt Concrete Paving	$	9.39	sy	5,624	$	52,810	RSERCD 2002 18 01 0312
2" Asphalt Stabilized Base Course	$	1.85	sy	5,624	$	10,405	RSERCD 2002 18 01 0105
10" Crushed Gravel Base	$	6.60	sy	5,624	$	37,119	RSERCD 2002 18 01 0102
6 oz. Non-Woven Geotextile	$	1.06	sy	5,624	$	5,962	RSERCD 2002 33 08 0531
Drainage Improvements over Capping Areas							
Wood Storage Area:							
Area drains with grates, 6' deep	$	2,450	ea	1	$	2,450	RSERCD 2002 18 02 0202
8" dia., Corrugated HDPE Type S piping with gaskets	$	6.00	lf	500	$	3,000	RSSWLCD 2002 02600 1020
Excavation and Loading							
Excavate All Areas	$	2.20	cy	1,685	$	3,707	Note 2/Vendor Quote 1
Digital Dust Sampler, Monthly Rental	$	850	mo	6	$	5,100	Note 3/RSERCD 2002 33 02 0312
Backfill							
Haul, Place, and Compact	$	13.60	cy	1,685	$	22,916	Note 2/Vendor Quote 1
Topsoil, 6" lifts, off-site source	$	25.32	cy	1,996	$	50,539	RSERCD 2002 18 05 0301
Seeding, Vegetative Cover	$	3,480	acre	2	$	8,352	RSERCD 2002 18 05 0402
Transportation & Disposal							
Excavated Soil	$	110	ton	2,570	$	282,800	Note 4/Vendor Quote 3
Confirmation Sampling							
Sampling Crew	$	150	hrs	104	$	15,600	Engineering Estimate
Dioxin Analysis (EPA 8290), Std Turnaround, Std. QC, soil	$	740	sample	25	$	18,500	Vendor Quote 4
Base, Neutral, Acid (EPA 8270C), Std Turnaround, Std. QC, soil	$	253	sample	25	$	6,325	Vendor Quote 5
Sampling Supplies	$	20.00	sample	25	$	500	Engineering Estimate
Sample Shipment	$	2.08	lb	150	$	312	RSERCD 2002 33 02 2043
QA/QC Review and Reporting	$	50.20	hr	10	$	502	RSERCD 2002 33 22 0110
Capital Cost Subtotal:					**$**	**1,254,700**	

Cost Worksheet

Alternative: 6
Element: Capping & Excavation
Sensitvity Analysis
Site: The Oeser Company Superfund Site
Location: Bellingham, Washington
Phase: Feasibility Study (-30% to +50%)
Base Year: 2002

Description	Unit Cost	Unit	Qty	Total	Notes/References
Direct Capital Costs					
Total Construction cost				$ 1,254,700	
Subcontracting Overhead			10%	$ 125,470	Engineering Estimate
Bid and Scope Contingency (15% + 15%)			30%	$ 414,051	Engineering Estimate
Total Direct Capital Costs (rounded to $100)				**$ 1,794,200**	
Indirect Capital Costs					
Legal Fees and License/Permit Costs			1%	$ 17,942	Engineering Estimate
Engineering and Design			6%	$ 107,652	EPA 2000
Project Management			5%	$ 89,710	EPA 2000
Contractor Reporting Requirements			3%	$ 53,826	Engineering Estimate
Construction Oversight			6%	$ 107,652	EPA 2000
Total Indirect Capital Costs (Rounded to $100)				**$ 376,800**	
TOTAL CAPITAL COSTS:				**$ 2,171,000**	

Description	Unit Cost	Unit	Qty	Total	Notes/References
OPERATIONS & MAINTENANCE COSTS					
Institutional Controls					
Total Annual Monitoring Cost for Years 1-5	$ 33,200	year	1	$ 33,200	See Capping Alternative Groundwater Monitoring Cost Worksheet
Total Annual Monitoring Cost for Years 6 - 30	$ 16,600	year	1	$ 16,600	See Capping Alternative Groundwater Monitoring Cost Worksheet

Cost Worksheet

Alternative: 6
Element: Capping & Excavation
Sensitvity Analysis
Site: The Oeser Company Superfund Site
Location: Bellingham, Washington
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Base Year: 2002

Description	Unit Cost	Unit	Qty	Total	Notes/References
Repairs & Maintenance					
Top seal coating - once every 2 yrs	$ 0.35	sy	34,558	$ 12,100	RSERCD 2001 18 01 0310
Patching ACPs & Paving Fabric 3% annually	$ 17.44	sy	1,040	$ 18,140	Vendor Quote 1; Years 1 to 10
Patching ACPs & Paving Fabric 6% annually	$ 17.44	sy	2,070	$ 36,100	Vendor Quote 1; Years 11 to 20
Patching ACPs & Paving Fabric 10% annually	$ 17.44	sy	3,460	$ 60,340	Vendor Quote 1; Years 21 to 30
NAPL Removal					
Crew	$ 150	hr	16	$ 2,400	Engineering Estimate
Oil-only SOC (flexible absorbent tube)	$ 48.18	case	1	$ 48.18	Note 5/Vendor Quote 6
Disposal of absorbent material	$ 0.36	lb	44	$ 15.84	Note 6/Vendor Quote 7
Annual NAPL Removal Costs				**$ 2,500**	

Cost Worksheet

Alternative: 6

Element: Capping & Excavation
Sensitvity Analysis

Site: The Oeser Company Superfund Site

Location: Bellingham, Washington

Phase: Feasibility Study (-30% to +50%)

Base Year: 2002

Notes

Note 1	This layer consists of (from top to bottom): Petromat (a geotextile), cold-spray-applied membrane, and another layer of geotextile.
Note 2	Includes labor, equipment, materials, and mob/demob
Note 3	Assumes the rental of 2 units for 3 months.
Note 4	Includes delivery of empty gondola cars, tarps and liners, transportation by rail from Bellingham, WA to final disposal facility in Grand View, ID, tracking of shipments, direct disposal at the disposal facility, and tax. Weight of soil estimated to be 113 pounds per cubic foot.
Note 5	Oil-only SOC is 3" by 12' and absorbs 12 gallons/11 pounds of oil. Each case contains 4 absorbent booms.
Note 6	Cost is for incineration. Unit cost of $0.12/lb was tripled to reflect extra cost incurred by not meeting BTU values.

References

EPA 2000	U.S Environmental Protection Agency, July 2000, *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study* , EPA 540/R/00/002.
RSERCD	RS Means, 2002, *Environmental Remediation Cost Data, 8th Annual Edition* , Environmental Cost Handling Options and Solutions LLC.
RSSWLCD	RS Means, 2002, *Site Work & Landscape Cost Data, 21st Annual Edition* , Environmental Cost Hanling Options and Solutions LLC.
Vendor Quote 1	Bert Hanson, Wilder Construction, Bellingham, Washington [(360) 676-2450]
Vendor Quote 2	LBI Technologies, Inc., Anaheim, California [(714) 384-0111]
Vendor Quote 6	Air Gas Direct Industrial Safety Products, Bristol, Pennsylvania [(800) 827-2338]
Vendor Quote 7	Rainer Elias, Philip Service Corporation, Redmond, Washington [(425) 227-0311]
Vendor Quote 3	Steve Welling, US Ecology Idaho, Grandview, Idaho [(916) 939-0967]
Vendor Quote 4	Michael King, Pace Analytical, Minneapolis, Minnesota [(612) 607-1700]
Vendor Quote 5	Mingta Lin, Columbia Analytical Services, Kelso, Washington [(360) 577-7222]